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Hewlett - Packard Company  
Legal Department, M/S 35  
Intellectual Property Administration  
P. O. Box 272400  
Fort Collins, CO 80527-2400

PATENT APPLICATION  
ATTORNEY DOCKET NO. 200207083-1

**APPENDIX A  
OFFICIAL**

**IN THE UNITED STATES PATENT AND TRADEMARK OFFICE**

Appl. No. : 10/600,875 Confirmation No. 6673  
Applicant : Blaine Stackhouse et al.  
Filed : Jun. 20, 2003  
TC/A.U. : 2800/2824  
Examiner : Dang T Nguyen  
  
Docket No. : 200207083-1  
Customer No. : 022879  
  
Title : Bias Generation Having  
Adjustable Range and Resolution  
Through Metal Programming

Commissioner for Patents  
P.O. Box 1450  
Alexandria, VA 22313-1450

**DECLARATION OF INVENTOR PURSUANT TO RULE 37 CFR 1.131**

Dear Sir:

I, John Wuu, declare that the following statements are true of my own knowledge, or are believed to be true if stated to be based upon information and belief, and if called upon, I would testify to the truth of these statements:

I am a Staff Engineer with Intel Corporation. Prior to January, 2005, I was a Member of Technical Staff with Hewlett-Packard Company, the assignee of the above-referenced U.S. Patent Application, Serial No. 10/600,875, filed June 20, 2003 (hereinafter "Application"). I began my employment with Hewlett-Packard Company in April, 1997. My education includes a Bachelor of Science in Electrical Engineering and a Masters of Engineering in Electrical Engineering and Computer Science, both from Massachusetts Institute of Technology, Cambridge, MA.

**APPENDIX A**

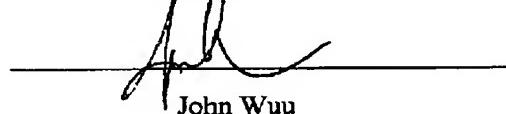
Declaration of Inventor Pursuant To Rule 37 CFR 1.131  
Serial No. 10/600,875

I am one of the co-inventors (hereinafter 'Applicant') named in the Application. I have read the Application and I am familiar with the contents of the Application. Moreover, I have read an Office Action from the USPTO mailed 05/18/05 (hereinafter "Office Action"), and I am familiar with the contents of the Office Action.

Prior to April, 2003, my co-inventors and I conceived the invention described in the Application, documenting that conception in an Invention Disclosure that was assigned HP Docket No. 200207083-1. In addition, prior to April, 2003, my co-inventors and I created and tested a computer-based simulation prototype of an embodiment of the described invention. The simulation prototype demonstrated the practical utility of the described invention for its intended purpose. Details of the invention and the prototype simulation were not publicly disclosed or published nor was the invention used for other than experimental and/or developmental purpose prior to the Application filing date.

I further declare that all statements made herein are made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code, and that such willful false statements may jeopardize the validity of the patent application Serial No. 10/600,875, or any patent issued thereon.

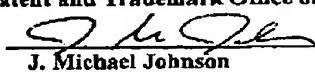
Dated on this 24 th day of July, 2005 at Fort Collins, Colorado.



John Wuu

**CERTIFICATE OF TRANSMISSION**

I hereby certify that this correspondence is being facsimile transmitted to the United States Patent and Trademark Office on the date shown below.



J. Michael Johnson

8/15/05

Date

\* \* \* \* \*

Page 2 of 2

Hewlett - Packard Company  
Legal Department, M/S 35  
Intellectual Property Administration  
P. O. Box 272400  
Fort Collins, CO 80527-2400

PATENT APPLICATION  
ATTORNEY DOCKET NO. 200207083-1

APPENDIX B  
OFFICIAL

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Appl. No. : 10/600,875 Confirmation No. 6673

Applicant : Blaine Stackhouse et al.

Filed : Jun. 20, 2003

TC/A.U. : 2800/2824

Examiner : Dang T Nguyen

Docket No. : 200207083-1

Customer No. : 022879

Title : Bias Generation Having  
Adjustable Range and Resolution  
Through Metal Programming

Commissioner for Patents  
P.O. Box 1450  
Alexandria, VA 22313-1450

DECLARATION OF A WITNESS

Dear Sir:

I, the undersigned, declare that the following statements are true of my own knowledge, or are believed to be true if stated to be based upon information and belief, and if called upon, I would testify to the truth of these statements:

I am an Engineering Manager with Intel Corporation. Prior to January, 2005, I was Project Manager with Hewlett-Packard Company, the assignee of the above-referenced U.S. Patent Application, Serial No. 10/600,875, filed June 20, 2003 (hereinafter "Application"). I began my employment with Hewlett-Packard Company in September, 1997. My education includes a Bachelor of Science in Electrical Engineering from the University of Texas at Arlington, and a Masters of Science in Electrical Engineering from the University of Colorado at Colorado Springs.

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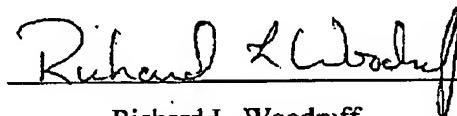
**APPENDIX B**

Declaration of Inventor Pursuant To Rule 37 CFR 1.131  
Serial No. 10/600,875

Prior to April, 2003, at Hewlett-Packard Company, I read, understood, and signed an Invention Disclosure for HP Docket No. 200207083-1 that described the conception of an invention. I also witnessed a computer-based simulation prototype of the invention described in the aforementioned Invention Disclosure.

I further declare that all statements made herein are made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code, and that such willful false statements may jeopardize the validity of the patent application Serial No. 10/600,875, or any patent issued thereon.

Dated on this 28 th day of July 2005 at Fort Collins, Colorado.



Richard L. Woodruff

**CERTIFICATE OF TRANSMISSION**

I hereby certify that this correspondence is being facsimile transmitted to the United States Patent and Trademark Office on the date shown below.

  
J. Michael Johnson8/15/05

Date

\* \* \* \*

Page 2 of 2

## APPENDIX C

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## INVENTION DISCLOSURE

PDNO 200207083

DATE RCVD [REDACTED]

PAGE ONE OF

ATTORNEY AJN

*Instructions: The information contained in this document is HP Confidential and may not be disclosed to others without prior authorization. Submit this disclosure to the HP Legal Department as soon as possible. No patent protection is possible until a patent application is authorized, prepared, and submitted to the Government.*

## Descriptive Title of Invention:

Method for shifting Programmable Weak Write Test Mode (PWWTM) target resistance range

## Name of Project:

Shavano

## Product Name or Number:

Was a description of the invention published, or are you planning to publish? If so, the date(s) and publication(s):

Not published before. If publishing, will likely be for [REDACTED]

Was a product or prototype including the invention (i) announced, offered for sale, or sold to any third party (for example, customer, supplier, contract manufacturer), or (ii) sold to HP by, for example, a supplier or contract manufacturer, or (iii) is such activity proposed? If so, when and to whom?:

No.

Was the invention disclosed to anyone outside of HP, or will such disclosure occur? If so, the date(s) and name(s):

*If any of the above situations will occur within 3 months, call your IP attorney or the Legal Department now at 1-898-4919 or 970-898-4919.*

Was the invention described in a lab book or other record? If so, please identify (lab book #, etc.)

Simulation block in /net/cvl-db3/mnt/db3d/l2d/data/l2\_shav\_wwtmsim4. Also in ppt slides sent to Don Weiss and Blaine Stackhouse.

Was the invention built or tested? If so, the date:

Simulated in l2\_shav\_wwtmsim4

Was this invention made under a government contract? If so, the agency and contract number:

No.

**Description of Invention:** Please preserve all records of the invention and attach additional pages for the following. Each additional page should be signed and dated by the inventor(s) and witness(es).

- Description of the construction and operation of the Invention (include appropriate schematic, block, & timing diagrams; drawings; samples; graphs; flowcharts; computer listings; test results; etc.)
- Advantages of the invention over what has been done before.
- Problems solved by the invention.
- Prior solutions and their disadvantages (if available, attach copies of product literature, technical articles, patents, etc.).

Signature of Inventor(s): Pursuant to my (our) employment agreement, I (we) submit this disclosure on this date: [REDACTED].

00319091 Blaine Stackhouse

*Blaine Stackhouse*

898-6300 55 40267970

Employee No. Name

Signature

Telnet

Mailstop

Entity &amp; Lab

J0243733 John Wuu

*John Wuu*

818-4213 55 40267970

Employee No. Name

Signature

Telnet

Mailstop

Entity &amp; Lab

24215 Don Weiss

*Don Weiss*

898-3242 55 40267970

Employee No. Name

Signature

Telnet

Mailstop

Entity &amp; Lab

J02437621120000PP 121910100000

Signature

Telnet

Mailstop

Entity &amp; Lab

*(If more than four inventors, include additional information on another copy of this form and attach to this document)*

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<b>INVENTION DISCLOSURE</b>		HP Confidential	PAGE	OF
Signature of Witness(es): (Please try to obtain the signature of the person(s) to whom invention was first disclosed.) The invention was first explained to, and understood by, me (us) on this date: [REDACTED] 1				
Full Name	Signature	Date of Signature		
RICHARD LACODRIFF	<i>Richard Lacodriff</i>	[REDACTED]		
Full Name	Signature	Date of Signature		

Inventor & Home Address Information: (If more than four inventors, include add'l. information on a copy of this form & attach to this document)				
Inventor's Full Name	BLAINE STACKHOUSE			
Street	7854 NANCY CT			
City	CO	State	80525	
Do you have a Residential P.O. Address? P.O. BOX	City	State	Zip	
Greeted as (nickname, middle name, etc.)		Citizenship		
USA				

Inventor's Full Name	John Wuu			
Street	1807 Jamison Ct.			
City	CO	State	80528	
Do you have a Residential P.O. Address? P.O. BOX	City	State	Zip	
USA		Citizenship		

Inventor's Full Name	Donald R Weiss			
Street	7951 Mockingbird Dr.			
City	CO	State	80525	
Do you have a Residential P.O. Address? P.O. BOX	City	State	Zip	
USA		Citizenship		

Inventor's Full Name	RICHARD L WOODRUFF			
Street	3833 CARRICK RD			
City	CO	State	80525	
Do you have a Residential P.O. Address? P.O. BOX	City	State	Zip	
USA		Citizenship		

## Write in Dark Ink on Front Side Only, Please

**Description of Invention:** Please preserve all records of the invention and attach additional pages for the following. Each additional page should be signed and dated by the inventor(s) and witness(es).

A. Description of the construction and operation of the invention (include appropriate schematic, block, & timing diagrams; drawings; samples; graphs; flowcharts; computer listings; test results; etc.)

- For history of PWWTM, please see section D.
- Schematic for the original PWWTM circuit can be found in Figure 2; the invention is shown in Figure 1.
- In the original circuit, there are 8 different settings for detecting various resistances.
- In this Invention, an NFET is added (please see Figure 1), with its drain unconnected. During actual silicon testing, if it is determined that the circuit needs to focus on a higher range of resistance, the metal can be easily modified to connect the NFET's drain to "AWWTM", thus shifting the target resistance range.
- There can be various extensions to this invention, including:
  - Multiple NFETs of different sizes added to allow for even more possible ranges.
  - One or more PFETs added, with G=GND, S=VDD, and D=unconnected but able to connect to AWWTM. Connecting one or more of these PFETs would shift the target resistance lower.
  - Instead of using these added FETs through metal programming, make simple changes to make the programming be controllable through some control signals (e.g. generated from MSRs)
  - As shown in Figure 1, have one or more PFETs that can be metal programmed to connect in parallel to PFETs that provide various settings. This, in effect, instead of shifting the target resistance range, provides more granularity to the original 8 without requiring more control signals and decoding logic.

**NOTE: This Invention is related to another disclosure titled "Defaulting Programmable Weak Write Test Mode (PWWTM) to Full Strength."**

B. Advantages of the invention over what has been done before.

- The previous designs can detect a set number of resistances in a set range; the invention allows testers to shift the range of resistance detection and offers finer detection granularity.

C. Problems solved by the invention.

- The Invention provides better guard band against missing the desired target resistance.
- The invention should help testers select the final setting faster and more efficiently.
- The Invention could reduce the number of mask turns required to find the final setting.

D. Prior solutions and their disadvantages (if available, attach copies of product literature, technical articles, patents, etc.).

- Weak Write Test Mode (WWTM) is a method developed by Intel Corporation which tests for SRAM retention faults. The original implementation, however, was not area efficient.
- In US patent # 6,192,001, we made improvements that allowed for WWTM to be implemented with essentially no area penalty.
- The down side to WWTM, however, lies in the difficulty in sizing the WWTM pull-down FET correctly. Therefore, Intel Corporation developed Programmable Weak Write Test Mode (PWWTM), which uses a bias generator circuit to generate an analog bias voltage that controls the strength of the pull-down. The generator is shown in Figure 2. However, due to the difficulty in predicting the target resistance detection range, there exists a real risk that the design would focus on a sub-optimal range.

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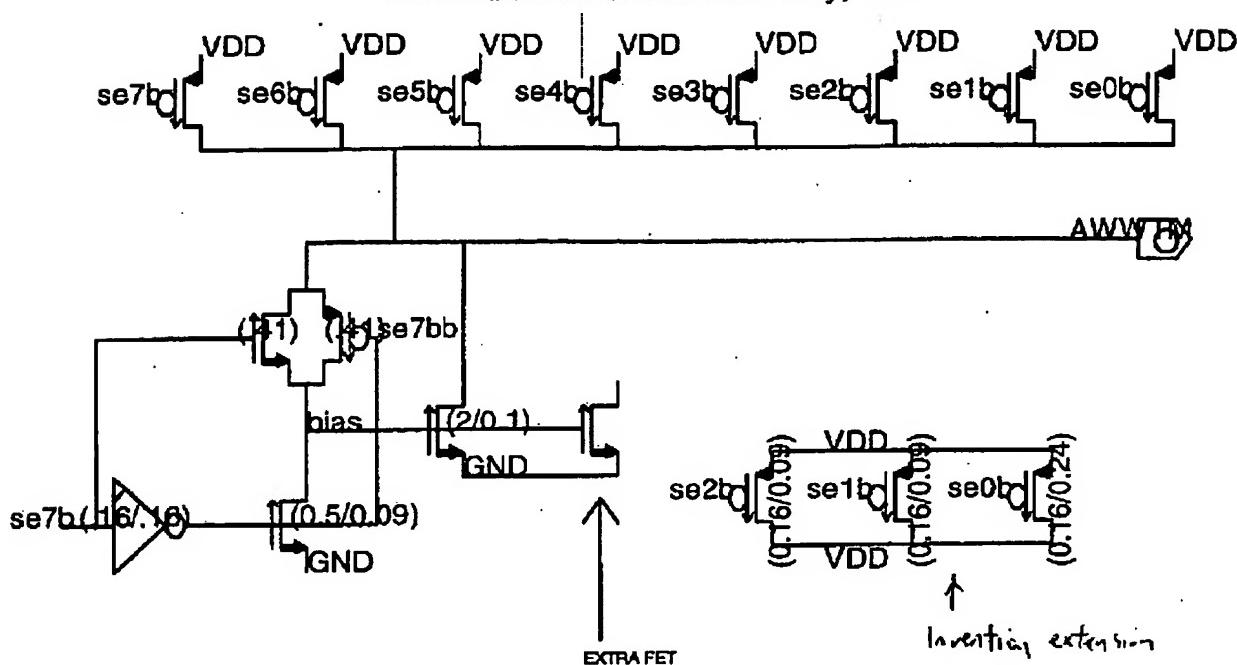


Figure 1: Schematics incorporating invention

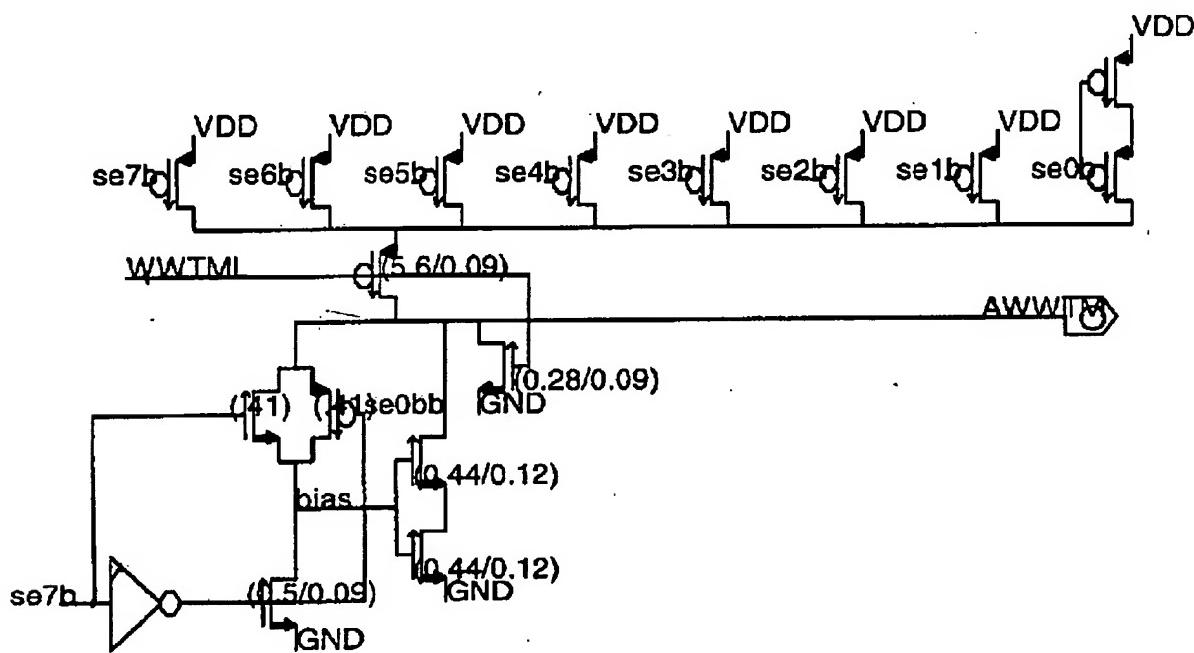


Figure 2: Original PWWTM bias generator schematics

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